

GESTURE-BASED MOBILE INTERACTION

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of U.S. Provisional Patent Application No. 60/956,776, filed Aug. 20, 2007, which is incorporated herein by reference.

FIELD

[0002] The present disclosure generally relates to mobile devices, and at least one particular implementation relates to interacting with mobile devices using a set of defined gestures.

BACKGROUND

[0003] Mobile devices, such as cell phones or PDAs, have several functions each of which may be activated through pressing a unique sequence of keys or through provided menus. As mobile devices get more and more features, accessing all of the features may become more complex given a limited number of buttons on the devices.

SUMMARY

[0004] According to one general implementation, and instead of selecting a control on a mobile device, a user may move the mobile device through a series of motions that define a gesture, in order to invoke certain functionality on the mobile device that is associated with that gesture. In doing so, functions may be implemented without requiring the use of physical buttons or user interface controls, allowing mobile devices to be made smaller and effecting increased accuracy in functionality selection.

[0005] According to another general implementation, a computer-implemented process includes sensing motion of a device using image data, and recognizing a gesture corresponding to the sensed motion of the device. The process also includes determining functionality of the device corresponding to the recognized gesture, and invoking the functionality.

[0006] Implementations may include one or more of the following features. For example, the motion may include a first motion in a first trajectory, and a second motion in a second, different trajectory. Recognizing the gesture may further include recognizing a character shape, geometric shape or pattern defined by the sensed motion of the device. Sensing the motion of the device may further include detecting a subconscious body movement of a user of the device, and the invoked functionality may be associated with the subconscious body movement. The process may also include detecting first and second user inputs at first and second times, respectively, where sensing the motion of the device further comprise sensing motion of the device occurring between the first and second times.

[0007] In further examples, the first input may be a shaking user input, a control selection user input, or a held-static user input. Recognizing the gesture may further include selecting the gesture based on comparing the sensed motion to a modeled vocabulary of gestures. The process may also include normalizing the sensed motion of the device, comparing the normalized, sensed motion to the modeled vocabulary of gestures, and determining a parameter based on comparing the sensed motion to the normalized motion. The functionality may be determined based on the parameter. The parameter may be input to the invoked functionality.

[0008] In additional examples, the vocabulary of gestures may be modeled using any number of Hidden Markov Models (HMM) or rule-based models. The process may further include selectively activating fewer than all available gestures in the vocabulary of gestures, where the gesture may be selected based on comparing the sensed motion to the activated gestures. The fewer than all of the available gestures may be enabled based on a manufacturer setting, a user setting or an application setting. The process may also include training the device to recognize a particular gesture, and adding the particular gesture to the vocabulary of gestures. Invoking the functionality may further include executing an application, manipulating an image, or inputting a character.

[0009] In other examples, sensing motion of the device may include detecting first and second user inputs at first and second times, respectively, the first time occurring before the second time, sensing a first motion in a first trajectory before the first time, sensing a second motion in a second, different trajectory after the second time, joining the first and second motions, and outputting the joined first and second motions as the sensed motion. Invoking the functionality may further include navigating in a virtual environment, manipulating an image, entering a character, executing an application, or invoking media hub functionality.

[0010] According to another general implementation, a device includes a sensor and a processor. The sensor is configured to sense motion. The processor is configured to recognize a gesture corresponding to the sensed motion sensed by the sensor, to determine functionality corresponding to the recognized gesture, and to invoke the functionality. In example implementations, the sensor may be a camera, and the motion may be sensed using optical flow.

[0011] According to another general implementation, a computer-readable medium is encoded with a computer program. The computer program includes instructions that, when executed, operate to cause a computer to perform operations including sensing motion of a device using image data, recognizing a gesture corresponding to the sensed motion of the device, determining functionality of the device corresponding to the recognized gesture, and invoking the functionality.

[0012] Implementations of any of the techniques described above may include a method, a process, a system, a device, an apparatus, an interaction interface, instructions stored on a computer-readable medium, or a computer-readable medium encoded with a computer program. The details of one or more implementations are set forth in the accompanying drawings and the description below. Other features will be apparent from the description and drawings, and from the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] FIG. 1 is a contextual diagram demonstrating invocation of device functionality in response to gesture recognition.

[0014] FIG. 2 is a block diagram of a device.

[0015] FIG. 3 demonstrates gesture combinations.

[0016] FIG. 4 illustrates gesture normalization.

[0017] FIG. 5 illustrates gesture training.

[0018] FIG. 6 illustrates subconscious gestures.

[0019] FIG. 7 illustrates an example gesture vocabulary.

[0020] FIG. 8 is a flowchart of an exemplary process.

[0021] FIG. 9 illustrates an environment for gesture training.

[0022] FIG. 10 illustrates an environment for gesture configuration.